



PATENTS ACT 1977

APPLICANT	XIHUA UNIVERSITY
ISSUE	Whether application GB 1801845.7 complies with Section 1(2) and Section 14(5)
HEARING OFFICER	Peter Mason

DECISION

Introduction

- 1 This decision relates to patent application GB 1801845.7 (“the application”) entitled “*Minimum non-reduction association rule mining method based on item subset example tree*”. The application derived from a PCT application published by WIPO as WO2017/201920 A1. This was filed on 13 September 2016 and claims an earliest priority date of 27 May 2016 from Chinese application 201610365087.1. The application was duly republished in the UK national phase on 22 May 2019 as GB 2568558 A.
- 2 The first examination report, dated 12 April 2018, raised issues of clarity and further warned that the application appeared to concern an invention which is excluded from being patentable. After two responses from the applicant, the examiner issued a third examination report under Section 18(3) maintaining objections to the clarity of the claimed invention and setting out the further objection that the invention was excluded from patentability under Section 1(2) of the Patents Act 1977 (“the Act”) as relating to a mathematical method and a computer program as such. As the response to the third report the applicant asked for a decision to be taken on this application based on the papers currently on file.
- 3 I note the examiner has deferred completion of the prior art search and has postponed full examination of the specification as a whole.

The Invention

- 4 The invention concerns mining database items and sequencing data in order to improve computational speed. The application has been translated from Chinese into English. There is one independent claim with four dependent claims. The main claim has been narrowed and its present form is reproduced in the annex.

Issues and Analysis

- 5 The examiner has issued three examination reports. Each of those reports sets out objections on the clarity of the claims; an objection to the invention being excluded from patentability as far as it can be understood is set out in the third examination report, having been foreshadowed in each of the earlier reports. Consideration of all other issues is postponed.

Clarity

- 6 The requirement that the claims be clear is set out in Section 14(5) of the Act:

The claim or claims shall –

(a) define the matter for which the applicant seeks protection;

(b) be clear and concise;

(c) be supported by the description; and

(d) relate to one invention or to a group of inventions which are so linked as to form a single inventive concept.

- 7 In each of their examination reports the examiner clearly states that the claims are not clear. In response, the applicant has submitted observations on how the terminology of their claims would be understood. The applicant has offered no response to the examiner's further objections presented in the report of 17 April 2020.
- 8 I have read the claims and the application as a whole. I have considered the examiner's issues with the clarity of the claims along with the applicant's response to those issues. Attempting to construe the claims, I am immediately confronted by ambiguous terminology within the first line. For example, the examiner and the applicant have been unable to agree on what the method must be suitable for in respect of whether "non-reduction" can be meaningfully and unambiguously understood. The applicant suggests "non-reduction" is understandable as the antonym of 'reduction', the latter being a known term in the art. The examiner has argued that 'reduction' is an operation and as such has no definable antonym, rather 'non-reduction' is merely defining what it is not. I am in agreement with the examiner's construction and consider this to be wholly ambiguous. Nonetheless, the most important factor is whether the method's steps can be determined with sufficient certainty.
- 9 Some of the terminology of the claim could be clarified, and to that end I note the examiner accepts the principle of the applicant's comments in respect of at least one issue¹; however, corresponding clear amendment to the claims has not been provided. But it appears to me there are fundamental problems within the claim and the applicant has been unable to address these by directing the examiner to clear enabling and supporting disclosure in the specification. For example, it is not clear to me how to determine with certainty from step 3 the "case set of which the subset of each item is fulfilled" and the "minimum generator" as required by the main claim as reported in the examination report of 17 April 2020. These issues mean the whole

¹ For example, the examiners paragraph 4 in their report of 17 April 2020

claim is immediately rendered ambiguous any further clarity issues within the claim notwithstanding. As such I do not consider any further detailed consideration of the claim clarity is necessary.

- 10 A claim must be clear in order for others to have certainty of when their actions infringe a patent. The examiner has presented several important points of clarity which have not been addressed and which I cannot readily see any way to resolve. In my considered view there can be no doubt the claims are not clear. I agree with the examiner's stated objections and the applicant has not provided sufficient response to satisfy me that the requirement of Section 14(5)(b) is complied with.

Excluded invention

- 11 For completeness I will consider the issue of whether the invention may not be patentable because it relates to one or more categories of excluded matter. The excluded categories are set out in Section 1(2) of the Act, the relevant parts of which I repeat here with added emphasis:

It is hereby declared that the following (amongst other things) are not inventions for the purpose of the Act, that is to say, anything which consists of

—

*(a) a discovery, scientific theory or **mathematical method**;*

(b)

*(c) a scheme, rule, or method for performing a mental act, playing a game or doing business, or **a program for a computer**;*

(d)

*but the foregoing provisions shall prevent anything from being treated as an invention for the purposes of the Act only to the extent that a patent or application for a patent relates to that thing **as such**.*

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- 13 I note the applicant's view that the claimed invention is patentable because it includes computing hardware^{2,3}. The applicant also explains the invention has technical effects on the hardware and solves the technical problem of slow calculation and storage, reducing running time and memory space⁴.

- 14 The precedent case law which helps to decide matters of excluded inventions is *Aerotel/Macrossan*⁵ and sets the following four-step test:

1. Properly construe the claim.

² Agent's letter of 10/8/18, p5, final paragraph

³ Agent's letter of 27/1/20, p5, sixth paragraph

⁴ Agent's letter of 10/8/18, p6, first and second paragraphs

⁵ *Aerotel Ltd v Telco Holdings Ltd and Macrossan's Application* [2006] EWCA Civ 1371; [2007] RPC 7

- 2. Identify the actual contribution or alleged contribution.*
- 3. Ask whether that contribution falls solely within the excluded matter.*
- 4. If the third step has not covered it, check whether the actual or alleged contribution is actually technical.*

15 Turning to the first step, I find myself presented with an insurmountable hurdle. As I have stated above, the claims are wholly unclear. In their examination report of 17 April 2020, the examiner has attempted to follow this test and I understand their attempts to progress the application. Nevertheless, I find myself failing at the first step: I cannot construe the claim. Without an understanding of the claimed invention it is not possible to determine even an alleged contribution. Consequently, I cannot properly form a view on whether the invention falls into any excluded categories.

Decision

16 I find the claims in GB 1801845.7 do not meet the requirements of Section 14(5)(b). The lack of clarity of the claims prevents me from forming a view on whether the invention falls into any excluded categories. I can find no amendment in the specification that will render the claims patentable. I therefore refuse the application under Section 18(3).

Appeal

17 Any appeal must be lodged within 28 days after the date of this decision.

PETER MASON

Deputy Director, acting for the Comptroller

Annexe

Claim 1 as presented on 27 January 2020:

1. A method for excavating a minimum non-reduction association rule based on an item subset case tree from a large case item database, comprising the following steps:

step 1: generating each of a closed item set corresponding to each item according to a closure operation between a case and an item in a case item database, wherein the closed item set meets the requirement that the support degree of each of the closed item set is the same as that of the corresponding item;

step 2: sequencing generated closed item sets from the large to the small according to the number of elements in the set to generate a subset of each item via union operation of the sets;

step 3: via the intersection operation of the sets, generating a case set of which the subset of each item is fulfilled, and constructing an item subset case tree structure based on generated case sets and an order of the generated case sets

(1) each node of the item subset case tree is represented as:

$$A' \times \tau (A')$$

where A' is one item subset generated by a generating basis B, and A' is the case set fulfilled by $\tau (A')$.

(2) each root node of the item subset case tree is represented as:

$$\emptyset \times U$$

(3) each sub-node of the root node is represented as:

$$C(aj) \times \tau (C(aj))$$

where the sub-node is arranged from the left to the right based on the number of the items included by $C(aj)$ from the large to the small, that is, from the left to the right, the first sub-node is the node where the number of the items contained by $C(aj)$ is the most, the last sub-node is the node where the number of the items contained by $C(aj)$ is the least, the node is arranged in serial number when the number of the items is the same.

(4) The sub-node of each sub-node $C(aj) \times \tau (C(aj))$ is generated based on the following way: let $C(a1) \times \tau (C(a1))$, $C(a2) \times \tau (C(a2))$, ..., $C(am) \times \tau (C(am))$ be the results arranged based on the requirement of (3), for each sub-node $C(aj) \times \tau (C(aj))$, the first sub-node thereof is as follows:

$$(C(aj) \cup C(aj+1)) \times (\tau (C(aj)) \cap \tau (C(aj+1)))$$

If there is $C(aj) \cup C(aj+1) \neq A$ and $C(aj) \supseteq C(aj+1)$ and $\tau(C(aj)) \cap \tau(C(aj+1)) \neq \emptyset$, other nodes can be generated based on $(C(aj) \cup C(aj+2)) \times (\tau(C(aj)) \cap \tau(C(aj+2)))$, ..., $(C(aj) \cup C(am)) \times (\tau(C(aj)) \cap \tau(C(am)))$ respectively and successively.

(5) For any node $A' \times \tau(A')$, it is assumed that there is $A' = A'' \cup C(aj)$, then the first sub-node of $A' \times \tau(A')$ is as follows:

$$(A' \cup C(aj+1)) \times (\tau(A') \cap \tau(C(aj+1)))$$

If there are $A' \cup C(aj+1) \neq A$ and $C(aj+1) \not\subseteq A'$ and $\tau(A') \cap \tau(C(aj+1)) \neq \emptyset$, other nodes can be generated based on $(C(A') \cup C(aj+2)) \times (\tau(C(A')) \cap \tau(C(aj+2)))$, ..., $(C(A') \cup C(am)) \times (\tau(C(A')) \cap \tau(C(am)))$ respectively and successively.

(6) When it is need to generate frequent item subsets, it is only need to increase the limit of the minimum support α in each node generation process, that is, for any node $A' \times \tau(A')$, increase the limit:

$$|\tau(A')| \geq \alpha;$$

step 4: excavating a closed frequent item set and a minimum generator thereof in the item subset case tree, and utilizing the excavated closed frequent item set and the minimum generator thereof to generate the minimum non-reduction association rule, wherein

$\max[A']$ is the closed frequent item set of which the support degree is $|\tau(A')|$ and, Let $A'' \in \min[A']$, if the case set of the subset fulfilled by the subset of A'' is $\tau(A')$, and the case set of the subset no less than the subset is also $\tau(A')$, then the subset is one minimum generator of the closed frequent item set $\max[A']$, $G_{\min}[A']$ is recorded as all of the minimum generators of $\max[A']$ obtained from $\min[A']$ and, wherein

the minimum non-reduction association rule is generated as follows:

the minimum non-reduction association rule with confidence of 1, for any equivalence category $[A']$, let $A1 \in G_{\min}[A']$, then

$A1 \rightarrow (\max[A'] - A1)$ is the minimum non-reduction association rule, the support degree thereof is $\sup(A1 \rightarrow (\max[A'] - A1)) = |\tau(A')|$, while the confidence thereof is $\text{conf}(A1 \rightarrow (\max[A'] - A1)) = |\tau(A')| / |\tau(A1)| = 1$.